tions are fulfilled, *La Caravane Universelle* may have something worth listening to, to tell the world monthly. At all events, we heartily wish the project success, and hope that Captain Bazerque may soon have a list of subscriptions large enough to encourage him to commence the practical organisation of his scientific pleasure-party. We see from *Les Mondes* of January 23, that at Captain Bazerque's request, M. de Quatrefages, president of the Academy, has nominated a committee to indicate the principal parts of the earth that ought to be specially explored, and to find out a number of young energetic European men of science, willing to accompany the expedition.

Hitherto such expeditions have been thought practicable only with Government assistance. If Captain Bazerque's scheme is successful in all respects, he will have the merit of showing that Science need not look to Government for help, even in her weightiest undertakings, though we fear the world is not yet ripe for this new application of "the voluntary principle."

FOSSIL CRYPTOGAMS

THE exogenous (circumferential) growth of fossil vascular cryptogams is a subject of so much interest and importance, that I may perhaps be permitted to say a few words regarding it. In a paper which was read at the December meeting of the Edinburgh Botanical Society, I combated the idea of the circumferential growth of calamites. The moist nature of the soil in which calamites must have grown would lead one to expect a poor development of the fibro-vascular bundles, and in comparing what I believe to be the fibro-vascular bundles of calamites with those of our recent equisetums, this idea is fully confirmed. Then in Equisetum there is a large development of the sclerenchyma of Mettenius, which forms the strong hypoderma. In a Brazilian fern which has come under my notice, this sclerenchyma runs to the fibro-vascular bundles, and presents an appearance exactly like Williamson's woody wedges, the large and small cells giving an appearance wonderfully like medullary rays. There is another point which, to my mind, is of much importance; namely, that in most of our recent vascular cryptograms, the embryonic parts do not enlarge; but as each successive leaf and portion of stem is produced, every such leaf and portion of stem is larger than the part preceding it, and this continues until a certain maximum is reached, when the stem becomes cylindrical. It is impossible to overlook that this mode of growth is evident in calamites, and until convincing proof can be brought forward of the circumferential growth of calamites, I must decline to accept it.

Turning from the calamites to Lepidodendron, it is evident that in it circumferential growth was much more likely to have occurred. In the calamites there is no evidence that they required year by year increasing quantities of water for purposes of transpiration, while in Lepidodendron the numerous small leaves which must have gone on increasing in number during the whole life of the plant (which however need not have been very long) demands that some addition to the conducting tissue should be made. As in botany we constantly find the same physiological purpose provided for in many morphologically distinct ways, I do not think it is at all necessary to believe in a form of growth identical with that in dicotyledons, because that would involve a complete change in type. Looking at such a stem as *Lycopodium chamaecyparissus*, in which the cortical tissues become so curiously modified, there is no difficulty in imagining that an increase by means of a cortical meristem might take place, a condition which I believe still exists in Isoetes. Hegelmaier in his paper, "Zur Morphologie der Gattung Lycopodium" in the *Botanische Zeitung*, 1872, p. 796, points out the presence in lycopods of a peculiar layer which he calls the *phloem sheath*, outside the phloem of the bundle, but inside the cortical portion, and therefore a series of cells belonging to the plerom and not to the periblem tissues. It seems to me probable that this phloem sheath may have represented a meristem layer from which new tissue was formed, as it would be the representative of the plerom meristem of the higher plants, while its position outside the vessels would further seem in some way related to the absence of vessels in the secondary wood of conifers.

Passing from the fossil lycopods, of which Lepidodendron is the type, with its central axis of fibro-vascular bundles, we come to Dictyoxylon, which I believe we must take as the type of Strasburger's new group the Lycopteridæ (Die Coniferen und die Gnetaceen, p. 259). Strasburger, in pointing out the relation of the archisperms to the vascular cryptogams, shows that the transition from the lycopods to the conifers is abrupt, and states that a new group intermediate between the two must have existed. To this group he gives the name Lycopteridæ, and I have no hesitation in referring Dictyoxylon stigmaria and sigillaria to it, and considering the former to be the type. The main root of stigmaria has more affinity with conifers than lycopods, while the branching of the root is distinctly lycopodiacous and not coniferous the root of conifers not branching in a dichotomous manner. It is not difficult to understand how the phloem sheath would in Dictyoxylon be still further differentiated, as plerom meristem, and even true cambium formed, thus affording the passage from the lycopodiacious to the archispermous stem. It is also not improbable that trigonocarpon may be referable to the lycopteridæ. While therefore I cannot see my way to accept the theory of the exogenous growth of calamites, I do not see any reason to doubt that in lycopods the circumferential growth may have taken place by means either of a periblem meristem, or plerom meristem, or by both: while in Dictyoxylon the relation of the growth of the stem to that of a conifer must be very close indeed.

W. R. McNab

NOTES

ONE of the principal events of the past week has been the funeral of Professor Sedgwick, whose death, though at a ripe old age and after a life devoted to work of the highest importance, yielding valuable results to Science, has called forth expressions of sympathy and regret from all quarters, from Royalty downwards. In this week's NATURE will be found a sketch of the life and work of the veteran geologist, from the pen of one who knew him long and well.

COALS in London are up to 48*s*. a ton, and there seems every probability that the rising process will continue. If they went at once up to 100*s*. a ton it might be the best thing that could happen to the nation, as thereby it might be "tunded" into adopting one or more of the obvious and easily applied means whereby the scandalous waste of our precious fuel might be avoided. It is a low average when we say that at least three-fourths of our coal is absolutely thrown away, and that simply because people "canna be fash'd" to prevent it. Men of science have dinned the alarming state of "the coal-question" into the ears of the nation for years, but we fear most men's heads, like their hearts, must be reached through their pockets. Sir W. Armstrong's address at Newcastle, which we reprint this week, is one of the most practical, forcible, and intelligent on the subject we have hitherto seen. It is deserving of attention from all who have to pay for coals.

THE Council of the Anthropological Institute has appointed a Committee of Psychological Research, viz., Francis Galton, F.R.S., chairman; Dr. John Beddoe; Hyde Clarke; David Forbes, F.R.S.; Sir John Lubbock, Bt., F.R.S.; E. B. Tylor, F.R.S.; A. R. Wallace; with power to add to their number, and to confer with other scientific bodies.

The United States exploring ship *Portsmouth*, which has been busily engaged in preparing for her cruise to the Pacific, has finally left for her destination. The scientific corps of the expedition is to consist of Messrs. Byer and Beardsley, from the Hydrographic Office, Washington, Paymaster Horace P. Tuttle as astronomer, and Dr. Streets as naturalist. The *Portsmouth* will carry three steam launches for cruising around shoal places.

The Tyneside Naturalists Field Club have struck out a new line of work for similar societies throughout the country. They propose to obtain a complete record of all remarkable trees at present growing in the district embraced by the club, whether from their age, dimensions, or historic associations. Seventy or eighty such trees have already been catalogued from information supplied by the members of the club; and it is proposed that the record shall be as full and complete as possible, both in respect to letterpress and illustrations. The letterpress is to consist of the fullest particulars obtainable as to measurements and history, and it is recommended by the Committee appointed on the subject that the illustrations be photographs taken by some permanent process, either Swan's "carbon" or the "Woodbury;" the expenses to be paid out of the general funds of the Club, the catalogue to be supplied to members of the Club for a small subscription, to the general public at a higher rate. It is obvious that such an illustrated catalogue will become very useful in after years, especially if the observations are repeated on the same trees at intervals. Though the Woolhope Club has already published in its Reports photographs of a few remarkable trees, we do not recollect that anything of this kind has been hitherto attempted in a systematic way.

The Academy of Natural Sciences at Stockholm has recently purchased one of the finest cryptogamic herbaria in existence, the great collection of European mosses formed by Milde.

The Royal Commission of Scientific Instruction and the Advancement of Science holds its first meeting of this session to day.

There are at present five candidates for the vacant Professorship of Geology at Cambridge—the Rev. T. G. Bonney, M.A., Fellow of St. John's College; Mr. W. Boyd Dawkins, M.A., F.R.S., of Jesus College, Oxford, and Director of the Owens College Museum, Manchester; the Rev. Osmond Fisher, M.A., late Fellow and Tutor of Jesus College; Mr. McK. Hughes, Member of the Geological Survey; and Mr. A. H Green, M.A., late Fellow of Caius College.

A Correspondent writes, with regard to hurricanes in the Mauritius (vol. vii. p. 250), that it is desirable applications should be made to the French Minister of Marine, as it is possible log-books of men-of-war may be preserved, which will fill up the lacunæ in the last century. In the beginning of this century our Admiralty records may supply additional information.

Dr. E. L. Moss, of the Royal Naval Hospital, Esquimalt, Vancouver's Island, writes us that on the night of Saturday, Dec. 14, an earthquake wave passed through the district at 9.33. A rumbling noise and a quick vibration, causing the windows to rattle, preceded the shock a few seconds. The waves then passed from E.N.E. to W.S.W., causing the wooden house in which he sat to creak and strain like a ship at sea, and leaving an index of their direction in the oscillations of a swinging lamp. He could not detect any accompanying marine wave. The ship's lights were reflected from the surface of the harbour in perfectly unbroken lines. The night was clear, the thermometer at 27°, and there was no trace of aurora. From the *Daily British Colonist* we learn that the shock appears to have been more severely felt on the mainland than on the island. At Olympia and Seattle the shock was very severe, and was accompanied by a slight tidal wave. At Clinton the ground was cracked, and the shock was felt at all the towns on the Fraser. Since 1864 Victoria has not experienced so severe a shock of earthquake.

Dr. Dudley, of Bogotà, South America, writes that on the morning of Dec. 17 last, at 4^{h} 20^{m} A.M., a smart shock of earthquake was felt at that place, which lasted about 20 seconds. It appeared to move in a S.W. direction. It was sufficiently strong to awaken the inhabitants from their sleep with some alarm.

The *Times of India* reports a very destructive earthquake which occurred in Sinde on the evening of December 15 last. A succession of shocks took place about 9 o'clock at Shekarpore and other places, followed by a slight shock at about half-past 10. In the town of Lehree, in Eastern Catchi and Zehri, according to one report 200, according to another 500 persons were killed from the fall of houses and walls. The direction of the earthquake was from east to west, with a slightly undulating motion.

According to a telegram in the *Times* from Constantinople, February 4, the island of Samos had been visited with successive shocks of earthquake during the previous four days, gradually increasing in violence. Houses have been destroyed, and the affrighted inhabitants of the island are wandering about the open country.

A Correspondent sends us the following:—"A correspondent in Salvador, in Central America, under date of December 8, writes to the *Panama Record* as follows:—'The volcano which is some six leagues distant from the town of Santana, has dried up a lake which for 500 years or so existed at the base of the craters; but although vast quantities of steam are ejected, and the trees lining the inside of the crater are scorched up and withered, as also are those to a limited distance near the top on the outside, no ejection of lava has yet taken place. The volcano of Isaleo, which was active until quite recently, now shows no sign of life; and the supposition is that some strata which cut off the communication between the two volcanoes have burst through or fallen in, and so changed the channel of the fire. The Government of Salvador intends sending up an exploring party to examine and report on the subject. At the date of the above letter, no change had taken place in the volcano.

Mr. Harding, senior wrangler at Cambridge, has been declared first Smith's prizeman; while the second prize has gone to Mr. Nanson, the second wrangler.

We have received a paper by Prof. Theodor von Oppolzer on the comet discovered by Pogson on December 2, following the telegraphic hint of Prof. Klinkerfues. Prof. Oppolzer enters into an elaborate series of calculations to prove that the observed comet was intimately connected with the star-shower of November 27, and that in all probability it was one of the heads of Biela's comet.

A report, coming of course from America, has been going the round of the papers that Prof. Tyndall has been coining money by thousands from his lectures in the United States. Dr. Bence Jones writes to *Les Mondes* of January 30, giving the facts of the case, as told by Prof. Tyndall himself. His expenses in America, partly caused by the death of "poor Millard," his assistant, have been very high. There still remains, however, Prof. Tyndall says, 2,000*l*. This sum he intends to devote, in consultation with Prof. Henry of Washington, to the promotion of some worthy purpose in America.

We are glad to see that a new edition of Chambers's *Information for the People* is about to be issued. The first edition was issued in 1833, and the last in 1857, since which, science in all its departments has made such rapid strides that scientific treatises published sixteen years ago must now be considered seriously defective and in many cases absolutely misleading. We are therefore glad to see from the prospectus that the scientific treatises have been entirely recast, so as to be adapted as nearly as possible to the present state of knowledge, and we have reason to believe that the various articles have been put into the hands of men who are acknowledged masters of their several subjects. Indeed we think it a sufficient guarantee that the work will in every respect be up to the mark, that the editorial supervision has been entrusted to Dr. Andrew Findlater, who has already deservedly won himself so great credit as Editor of Chambers's *Encyclopædia*; science at least is likely to have fair play in his hands. This work has already done much good in spreading accurate and valuable knowledge among the people. We hope the new edition will have as wide a circulation as its predecessors among the classes for whom it is adapted.

A SUPPLEMENTARY number of *L'Institut* has been issued, containing reports of the French Academy from September 5 to December 26, 1870, during which time, on account of the investment of Paris, the publication of the journal had to be suspended. Besides the French Academy, it contains reports of the Royal Society, the Berlin, Munich, and St. Petersburg Academies of Science, and the Göttingen Society of Science for the same period.

WE have received the "Report of the Birmingham School Natural History Society" for the year 1872, and a very satisfactory one it is. The society was founded in 1869, under the auspices of the Rev. C. Evans, Head Master of the school, since which it has made very creditable progress. Liberal grants have been made by the governors of the school for the purchase of books on Natural History, and the library contains several standard works. In 1871 a museum was fitted up, and during the past year three sections have been formed—botanical, entomological, and geological; and it is hoped that, eventually, new sections will be formed for the study of other subjects, such as physiology, zoology, &c. Three excursions have been made during the year, and there would have been several more, had it not been for unfavourable weather. The report contains some very creditable papers by the youthful members of the society, and we hope that future reports will contain the results of original observations on the part of the members.

FROM the report of the Grant Medical College, Bombay, we learn that during 1872 the total number of students was 283, showing an increase of 37 over 1871. Great improvements have taken place in the Museum, and Dr. Sylvester, the officiating principal, says, that for the last twenty years it has not been in such good order as it is at present. Dr. Sylvester reports that the system of education is not so sound and deep as it ought to be, and wisely reccommends that some subjects should be omitted from the course, and a more strict and penetrating knowledge insisted on in the others. He also seems to think that more care ought to be exercised in the appointment of professors, and that a sort of supplementary professor should be appointed to each chair, who would be ready at any time to undertake the duties of the professorship in case of a vacancy.

WE are glad to notice that the evening lectures to working men at the school of Mines have been eminently successful. The 600 available seats are all occupied, and about 600 more applicants have been necessarily refused. Those who attend are all *bona fide* working men, who in various ways show that they appreciate and understand the scientific lectures delivered. Each professor gives a course of six lectures every other year.

EARLY on Saturday morning a fire broke out in the Royal Military Academy at Woolwich, which terminated in the total destruction of the large central block of the building. A foul flue is supposed to have been the cause of the fire. The damage is estimated at 100,000*l*.

THE principal paper in *La Revue Scientifique* for February 1 is a long analysis of Darwin's Descent of Man, which has recently been translated into French. The writer endeavours to give a perfectly fair view of the work, but the tone of the article shows that Darwin is beginning to be better understood and appreciated in France than he has hitherto been. The writer sees in Darwinism a gigantic effort of the human mind to arrive at an explanation of phenomena which had previously been regarded as beyond the human grasp. He thinks it the duty of every naturalist, whatever may be his leanings, to study the facts and theories put forth by Darwin.

WE have received the prospectus of a German work likely to be of considerable interest and value—a history of Writing ("Geschichte der Schrift und Schrifttums," &c.) and written characters, symbolical and otherwise, from its earliest beginning in the shape of tattoo marks, down to the signs used in modern telegraphy, including an account of the modes of writing among all the nations of the world, savage and civilised. The specimens of the illustrations sent us are carefully executed; one of them represents a man, most elaborately and minutely tattooed from the crown of his head to the tips of his toes. The author is Heinrich Wuttke.

WE noted some time since that the French Government contemplated suppressing the *Bureau des Longitudes*, in order to save its expense to the nation. The French Academy has made a vigorous and indignant protest against such a philistian proposal. The protest recounts the glories which have in former times accrued to France from the discoveries of its eminent astronomers, shows the important position formerly held by the *Bureau*, the valuable assistance it has given to astronomy and navigation by means of its journal, the *Connaissance des Temps*, and declares that by degrees in recent years, the means of doing efficient work have been withdrawn from it. Since 1854 the *Bureau* has ceased to have the control of the Observatory. The Academy demands that instead of suppressing the institution, Government should restore to it the means of making itself more useful.

THE first number of an illustrated paper printed in Japanese, *Tai Sei Shimbun*, or *Great Western News*, was published in London on January 15. Its object is to clearly reflect the opinions of Japanese who have seen the world and learned European languages for the benefit of their countrymen at home. It is edited by a Japanese resident in London, in conjunction with Prof Summers, of King's College.

A CORRESPONDENT writes asking us whether any Alpine walker among our readers has had experience of Sir T. Troubridge's knapsack, the weight of which is borne principally upon the pelvis instead of on the shoulders, thus leaving the chest more free. Also where it can be obtained.

WITH the commencement of volume lxxxi. of *Astronomische Nachrichten*, the office of that journal will be removed from Altona to the Observatory at Kiel, to Prof. C. A. F. Peters, at which address all communications should be sent.

NO. 1917 of *Astronomische Nachrichten* is mainly occupied with letters from various quarters on the star-shower of Nov. 27, 1872.

TO No. 1919 of *Astronomische Nachrichten*, Prof. Spörer contributes the results of observations on the distribution of sun-spots for the periods of rotation, vi. and vii., for the year 1871.

Sir Bartle Frere and suite arrived at Zanzibar Jan 12.

North Africa is at present overrun by exploring expeditions. The latest news from Sir Samuel Baker is contained in a telegram dated Khartoum, Nov. 7, 1872. According to this he left Gondokoro in 1871 for Kimrasi, but from the hostility of the natives was compelled to return some distance. In consequence of the prolonged absence of Sir Samuel, we learn from *Ocean Highways*, the Viceroy of Egypt decided upon sending a relief expedition of sixty-five men under the command of Colonel Purdy, an American officer in the Egyptian service. The plan is to start from Mombas and to make a journey to the supposed position of Baker, above Gondokoro. If the expedition is successful, very important geographical results may be expected from the route to be taken by Colonel Purdy, which will lead him across the Victoria Nyanza region.

Ocean Highways for February contains the first part of an article by Dr. Beke, entitled, "Position of the Sources of the Nile," his object being to show the influence which Ptolemy's determination of these sources has had on later geographers, down even to Livingstone, who adheres essentially to Ptolemy's opinion. The almost unanimous conclusion, however, come to by geographers of the present day, Dr. Beke tells us, is that the rivers described by Livingstone are tributaries of the Congo, and that the numerous sources described by him as the great water-parting of Southern Africa, are those of that river, and not of the Nile.

Comandatore Negri is making satisfactory progress in his endeavour to enlist Italian public opinion in favour of an Italian Arctic expedition.

The first number of *Kosmos*, an Italian geographical bi-monthly journal, edited by Guido Cora, has just appeared.

In Nature for Jan. 23, we noted the supposed discovery of a great Arctic Continent by M. Pavy. The story appeared many weeks ago in the *Scotsman*, which took it from "the American papers." We, however, took no "note" of it till a similar account appeared in the *Times* a week or two ago, when we noted it with some expressed distrust. According to *Ocean Highways*, the story, as we feared, turns out to be, in all likelihood, a hoax. The French Geographical Society have received no such report as the American papers say has been transmitted to them. Far from M. Pavy having reached Wrangell Land, there are now doubts whether the expedition will start at all.

We learn from the *Athenæum* that Sir John Lubbock is preparing a Bill, to be brought forward early this session, having for its object the preservation of the megalithic monuments to the United Kingdom.

We have received the first number of the *Journal of the Women's Educational Union*, the main purpose of which is to promote the very commendable objects of that Union.

From pamphlets and periodicals before us we cull the following notes:—Dr. Hollis's *Astronomical Almanack* for 1873 contains a large quantity of very valuable and well-arranged information, which will be found useful to the rapidly increasing number of amateur astronomers, and to those who do not possess or who shrink from consulting the "Nautical Almanack."—The *Garden* learns that the celebrated Jardin Fleuriste of the city of Paris, which since the war has been in a ruinous condition, is at last to be entirely abolished, and the ground whereon it stood let for building purposes. A few years ago it was one of the most interesting and instructive gardens in existence.—The principal articles in the *Journal de Physique* for January are a review of the fundamental theories relative to electrodynamics and induction, by M. A. Potter: one by M. Berthelot on Calorimetric thermometers, in which he expounds the results of his studies on the subject for a number of years past; and a short one by M. C. Decharme, giving the results of a number of experiments to show the rate at which different liquids ascend a capillary tube.—A French newspaper, the *Monde*, contains a justly laudatory article on the Abbé Moigno's *Salles du Progrès*, which it seems are being more and more taken advantage of by the Parisian middle classes.—The "Annuaire de l'Academie Royale de Belgique," besides a mass of valuable information concerning the Academy, contains memoirs of a number of deceased Academicians, including one of the late Mr. Babbage, who was an associate of the Academy.—The *Penn Monthly* (Philadelphia) for May, July, August, and September, contains a series of articles by Mr. Edward D. Cope, on "Evolution and its consequences," in which is expounded the theory of evolution so far as it concerns animals and plants.—We have received a reprint from the *Quarterly Journal of the Geological Society* of the admirable paper "On the Evidence for the Ice-sheet in North Lancashire and adjacent parts of Yorkshire and Westmoreland," by Mr. R. H. Tiddeman, M.A., F.G.S., of the Geological Survey. It is accompanied by a well constructed map.—An address delivered before the Chemical Society of the Lehigh University, by Dr. B. Silliman, on "Deductive and Inductive Training," contains a very interesting history of the two systems from the earliest times to the present day.—A translation of Prof. Donati's oration at the inauguration of the new observatory at Florence, October 27, 1872, appears in the *Astronomical Register* for February.

ON THE COAL QUESTION [*]

THE North of England Institute of Mining and Mechanical Engineers was, in its origin, a society limited in its scope to the discussion of subjects belonging to the practice of mining, and especially of coal mining. At that period the working of coal and other minerals was carried on with less aid from machinery than at present, and the district in which the society is located was not so distinguished as it now is for the practice of mechanical engineering in all its branches. Hence, the society, in its growth, has gradually assumed more and more of an engineering character; and my recent election, as your president, indicates that mechanical science is no longer regarded by the members as secondary, or merely subsidiary, to the practice of mining. But we must guard against this tendency of the engineering element to outgrow the mining element of this institute. We must not forget that we are situated in the very heart of the coalfield which, more than any other, has rendered England pre-eminent as a producing nation, and that, notwithstanding the increasing magnitude and importance of the engineering works of this district, the raising of coal is still foremost amongst the industries of the North, both as regards the extent of the interests involved, and its importance to the general prosperity of the nation.

For these reasons, although I come before you as the first president of this society elected from the ranks of mechanical engineers, I shall, in this address, make coal the principal topic of my remarks, including, however, mechanical applications associated with its use or involved in its production. As I shall speak of coal in an economic as well as in a technical point of view, I cannot well avoid making some reference to its present excessive cost, because coal, like everything else, must be governed in the extent of its application by its price in the market. In addressing an institution, so largely composed as this is of colliery proprietors, it is not an agreeable task to dwell on the evil of dear coal; but our institution is not a commercial one, and I must speak of this subject, not as affecting individual interests, but as bearing upon mechanical art and national prosperity. For many years past the consumption of coal has been increasing at the rate of about 4 per cent. per annum, computed in the manner of compound interest. We are all familiar with the cumulative effects of compound rates of increase; and it is easy to see that if the consumption of coal continued to advance at this rate, we should speedily arrive at impossible quantities. Thus in 18 years our present enormous consumption would be

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[*] Inaugural Address by Sir William Armstrong, C.B., President of the North of England Institute of Mining and Mechanical Engineers, delivered at Newcastle, February 1.